Appreciating systems: critical reflections on the changing nature of systems as a discipline in a systems-learning society

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Appreciating Systems: Critical Reflections on the Changing Nature of Systems as a Discipline in a Systems-Learning Society

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The paper reports a reflective inquiry into the strengths, weaknesses, opportunities, and threats (SWOT) of systems-related courses developed and presented up to 1995 by the former Systems Department in the Open University, UK. The SWOT analysis is considered in the context of the "systems movement" in its broadest sense. Based on the OU experiences the institutional challenges of systems-as-discipline and interdiscipline are explored. Three strategies for the future are suggested: (i) the potential of Systems Departments to demonstrate rigorous and coherent interdisciplinarity; (ii) for systemists to work harder to bridge the divide between their espoused theory and theory in use, particularly in their own institutional settings and (iii) the need for a rigorous pedagogy for "systems practice."

KEY WORDS: appreciative setting; systems learning; systems-as-discipline; learning society; critical reflection.

1. INTRODUCTION

1.1. Background to the Paper

This paper arises from a reflective research exercise internal to the former Systems Department of the Open University on the strengths, weaknesses, opportunities and threats (SWOT) of the department's systems and systems-related courses. As marketing research, the overall SWOT analysis was an initial attempt to explore the relevance of courses to students' everyday personal, social and working lives. It also aimed to identify "stakeholder" views about how to respond to changing needs, markets, and new communication technologies. The written SWOT analyses for courses were complemented with information obtained through interview and conversation.

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1.2. Scope of the Paper

Open University tutor and student views of what constitutes the academic field of Systems is inevitably influenced by the content of Open University courses. For this reason, we have considered the SWOT analyses in the context of the “systems movement” in its widest sense, including other British Systems Departments, other disciplines where it is employed, and areas of societal discourse where systems ideas are becoming influential–environment, development, and the ‘holistic’ movement, for example.

The steady growth and popularity of systems thinking in all these areas over the last 20 years, together with the enormity of the “systems project,” has changed, and is changing, the appreciative setting (Vickers, 1968) of Systems as a discipline. The implications of some of the SWOT analyses led us to consider the relevance of a Systems discipline—remembering that, unlike most other disciplines, it has essentially been regarded as a way of thinking rather than a domain of inquiry with a distinct subject-matter. This raises a number of questions: How can systems-as-discipline keep ahead of an expanded systems field? How can it learn to adapt to its changing appreciative setting—a society that is starting to understand itself systemically, and an academic community that is increasingly receptive to systems ideas? What is to be its new role now that one of its main raisons d’être is being realised? What unique feature(s) distinguish it from subject-disciplines that are developing systemic theory and practice of their own?

These questions, in the context of our own setting—a large university-based Systems Department which in 1995 had a 22-year contribution to the wider systems community—are central to this paper. We are not alone in asking; at the 1995 United Kingdom Systems Society (UKSS) conference (Ellis *et al.*, 1995) there was a profound sense that Systems, as a discipline, was in the midst of an identity crisis and at a critical point in its development.

A related issue is how and why, if at all, Systems was established as an academic discipline. The organizers of the UKSS conference described it as a “transdiscipline” to add to the growing stable of definitions—systems science; a metadiscipline or an interdisciplinary meta-subject (Flood and Carson, 1988). At the conference Checkland (1995) argued that the General Systems Theory (GST) project had failed and that systems scholarship in the future would be embodied in particular domains of application. Jackson (1995) essentially agreed, arguing that we should “abandon the notion that Systems has a subject matter of its own” and apply it to other disciplines so that it becomes entirely critical. His metaphor was that it should become the handmaiden of other disciplines.

The history of systems within The Open University (OU) reflects this identity problem. It has been variously called the “Systems Group,” the “Systems Discipline,” and the “Systems Department.” All terms were still used in 1995, but, organizationally, we were until 1998 a recognized Department within the Faculty of Technology. This paper is concerned with developments prior to the 1998 changes. It contributed to and arises from a process of internal dialogue about our future domains of scholarship and appropriate organizational form(s).

We intend this paper to stimulate critical reflection on the status of systems as a discipline given its changing appreciative setting, on the dilemmas this reveals, possible new directions, and the contribution of systems learning in a learning society. It can be thought of as an interpretative, second order analysis of systems-as-discipline. Before considering the above issues and the nature of the identity crisis in more depth, we shall provide some background on the OU Systems Department and the SWOT analysis.

2. SYSTEMS AT THE OPEN UNIVERSITY

2.1. Origins and Design

The OU Systems Department was in 1995 one of very few throughout the world. It had been offering undergraduate systems-based courses by supported distance teaching since 1974. When it was established, there were three other British universities offering systems-based courses and degrees but emphasizing postgraduate education and research.

Aston and City Universities were mostly focused on engineering-based "hard" systems—operational research and management science, and mathematical modeling respectively. Lancaster was the first to stress the shortcomings of "hard" approaches when applied to management and human systems. It set an important precedent for the direction of soft systems thinking in UK universities, primarily through Checkland's Soft Systems Methodology (SSM) and the influence of Geoffrey Vickers.

The OU Group combined both "hard" and "softer" approaches and, thanks to the rigors of designing distance learning courses, contributed to further elaborating and systematising systems methodologies, including SSM (Beishon, 1980; Naughton, 1981). The Open University was the first to focus on undergraduate teaching.

The Systems Department was conceived by the first Dean of Technology, Geoff Holister. There were five professors in the original faculty—Systems, Communications and Design, Engineering Mechanics, Materials, and Electronic Design (Holister, 1974). Holister, an engineer, saw a need for technology and its design to take more account of the human and other contexts on which it depended and impacted. Systems and Design were therefore seen as key process-disciplines that were to work in close collaboration with the more conventional subject-disciplines of technology. They would contextualise and synthesise the subject-disciplines and act as catalysts for interdisciplinarity (Holister, 1974):

> I felt that a concern for and systematic study of the social and environmental aspects of technology was essential. Certainly environmental problems were approachable only by means of systemic and interdisciplinary methods and I felt convinced that any Faculty of technology that did not concern itself with such problems could not claim to be either modern or responsible, whether socially or academically. (This was in 1969—before the environment had become a fashionable subject.)

Systems, and Design and Communications were to start with:

> the broader concepts initially . . . Creative design (as distinct from the more formalised engineering development methodology often taught as engineering design) requires the generation in the student of an ability for synthesis (rather than analysis) . . . an area where traditional teaching methods have a doubtful validity.

With regard to systems, Holister (1974) continued:

> Within the last fifty years . . . our progress appeared to be limited not by the availability of materials or sources of power but by our limited understanding of the very complexity of the systems we were developing. Most of the exciting developments in technology (general systems theory, cybernetics, etc.) seemed to me to be in this area of trying to understand and control complex systems.

The department would also take in engineering control theory and the newly developing management science.

From its inception, then, the role of the Systems Department was to encourage the specialist disciplines to take a more systemic approach to themselves and to the effects of their activities.

Systems was establihsed as a distinct discipline to conform with existing academic structures and came to be viewed as a subject-discipline. But, its status as a subject-discipline is ambiguous, as any systemist can vouch for when asked to explain what, exactly, systems is. An answer as straightforward as describing, say, biology, engineering or philosophy is hard to give. The latter have domains of inquiry which are all socially accepted. The question strikes at the heart of the identity crisis in systems-as-discipline.

Many new disciplines have emerged over the last 2 centuries—economics, anthropology, sociology and, more recently, information science. None of them have encountered so much difficulty in defining themselves. Most have arrived at a point where the question of what "it" is does not arise anymore. So why does it with Systems? Are we confronting a problem born of a lack of appropriate language to talk about systems, insufficient work and time to get established (as in the Latourian sense—Latour, 1987), or is it more fundamental than that?

3. REVEALING SYSTEMS THINKING: THE ROLE OF THE OPEN UNIVERSITY

3.1. Clarifying Systems

The OU can legitimately claim to have done a service to the systems community by clarifying systems concepts, and making them accessible and widely available. The OU's teaching materials were more structured, logical, and comprehensible than any others before them as they were designed for students to use at home with little tutorial support. This revealed shortcomings in systems theory and practice, as John Beishon, the first Professor of Systems, described:

> (Teachers had to) examine and test the concepts, terms, methods, and processes involved in systems thinking in great detail. This revealed a disturbing amount of confusion and inconsistency in current systems terminology and practice and also an obscurity in much published material that led us to suspect that many writers did not understand their material. It also revealed a preoccupation with mathematical formulations ... which turned out to be based on dubious or trivial conceptual foundations. (Beishon, 1980)

Comments from the SWOT analyses show that the clarity of OU systems teaching materials has had a great, sometimes revelatory, impact on students and the ways they think about their problems and the world. For one respondent, "reflecting on my past work led me to take a completely different approach to my work (and myself!)." With regard to one course in particular, she continues, "it has made an enormous difference in my life. I applied to tutor on it because I wanted to keep working on the course material." Such sentiments are not uncommon, yet the Systems literature, with the exception of Salner (1986), is devoid of meaningful research which illuminates the effects of systems thinking and practices on individual learning or personal transformation.

3.2. Systems in Context: The Open University Trademark

Table I summarizes the main fields in which OU Systems academics have contextualized systems thinking through course materials, set books and other publications. Table I summarizes the main courses that have been developed through the OU's unique team-based, or course team, approach to pedagogy. Courses fall into two strands. Those which are clearly Systems focused, labeled "understanding systems and systems thinking" and those applied to "managing" particularly in organizations. The title of each course and its OU code are given together with the period it was available to study. The successor course code is also given, e.g., Systems Modelling T341 was replaced by T301.

It is impossible to do credit here to the range of contributions. They range from engineering-based "hard" systems, such as design and management of manufacturing technology to "softer" organizational behavior and people manage-

Table I. The History and Contribution to Systems Thinking of the Open University Systems Department's Courses Prior to 1996

Understanding Systems and Systems Thinking	**Managing in Organizations—A Systems Perspective**
Systems Behaviour (T241): 1973–90 (T247). Emphasis on understanding and describing interactive behaviour of social, biological, economic, industrial and engineering systems developed through six case studies on aspects of Air Traffic Control, Industrial Social Systems, Planning Systems, UK Telephone System, Grassland Ecosystems, Human Respiratory System. **Course reader:** *Systems Behaviour*, Open Systems Group (eds), Harper and Row, 1981.	*Systems Management* (T242): 1974–79 (T243). Organisations as systems & their behaviour, illustrated with case studies. Conventional management functions, people management, socieconomic aspects, goal-setting, conflicts, information and decision making.
Working with Systems (T247): 1991–1999 (T205). Introduction to systems thinking, representation, modelling, diagramming, diagnosis, intervention. Topics include design of simple information system, ethical investment, ecology of a garden, how acupuncture works, and group decision-making. Blocks on Representing Systems, Diagnosis, Intervening in Systems and Systems Thinking. For working in a highly interdependent society.	*Systems Organization: The Management of Complexity* (T243): 1980–84 (T244). "Knowing the system": Gaps between theory and practice. Intro. to systems ideas in organisational practices and effects; tools & strategies for avoiding traps due to preconceptions or oversimplification; themes of control, change and conflict, interdisciplinarity, need for "holistic", practical understanding, ability to use various frameworks and levels of analysis. Practical, work-based emphasis. **Course reader:** *Organizations as Systems* by M. Lockett and R. Spear (eds.), Open University Press, 1980.
Food Production Systems (T273): 1978–85. Production and supply of food on a world scale, its processes and likely future changes. Interdisciplinary, incl. biology, chemistry, social, economic and political factors influencing organisation and control of the technical processes of food supply. Units on world food problem; human nutritional needs; maximisation of crop production; effects on food supply of using animals, micro-organisms, of foodstuff processing, producer and consumer demands, organisational contexts, politics and national priorities, world trade.	*Managing in Organizations* (T244): 1984–94 (T245). Practical, "learning from experience" orientation; tools for tackling problems and "messes" in organisations; intellectual and social aspects of problem-solving. Wider work context of relations, challenges & preconceptions about organisations. **Course reader:** *Organisations: cases, issues, concepts* by Rob Paton et al. (Eds.), Harper and Row, 1984.
Systems Modeling (T341): 1975–84 (T301). Quantifying effects of complex decisions; mathematics in social and economic decision-making; emphasis on values and how model choice can disguise critical value judgements; skills and techniques in modelbuilding; adequacy of quantitative methods to represent values; modelling community decisions and macro economics.	*Managing in Organization* (T245): 1995–2000 (T205). Up-dated version of T244; "tools for thought" applicable to organisational matters and own organisational life; understanding organisational relationships; generating a more rounded understanding of and response to complicated issues. Units: Problems about organisations; Work groups incl.) group[psychology); Organisations (structures, processes, power, conflict, decision-making; problem-solving); Interorganisational relations contexts, markets, patterns); Wider perspectives (new perspective; case study); explains common organisational practices, eg. organisational development, management by objectives. **Course reader:** *Organizations–Cases, Issues, Concepts* by Rosalind Armson Armson and Rob Paton (Eds.), Paul Chapman, London, 1995.
Systems Performance: Human Factors and Systems Failures (TD342): 1976–83 (T301). Sociotechnical failures (small-scale accidents & large scale policy). Emphasis on relationship between failures and objectives/expectations of stakeholders. Analytical techniques; case studies of catastrophes, science policy, mental health provision and a Rapid Transit system; safety, effectiveness & reliability in design, including ergonomics. **Course readers:** *Catastrophic Failuers* by V. Bignell, G. Peters and C. Pym, Open University Press. *Human Aspects of Man-made Systems* by S. C. Brown and J. N. T. Martin, Open University Press.	
Managing Complexity & Change. A Systems Approach (T301) 1984–1999 (T306).	

Table I. (Continued)

Introduced students to systems methodologies for managing change and complexity viz. The Systems Failures Method (Fortune & Peters 1995); the Hard Systems Method and Soft Systems Methodology. Included set and free choice project options. **Course text:** Carter et al (1984). Systems Management & Change. A Graphic Guide. Technology Foundation *The Man-made World* (T100): 1971–79. *Living with Technology* (T101): 1980–88. *Living with Technology* (T102): 1988–98. Technology in social and societal context incl. pollution, employment, energy, politics, economics, values, sustainability; skills for tackling complex problems, basic engineering, science, economics, learning & communication skills. **Course book:** *Fuel's Paradise: Energy Options for Britian* (2nd edition) by P. Chapman, Pelican, Harmondsworth, 1979. **Note:** Several nondegree programme Study Packs have also been produced on Nature Conservation and Countryside Management and Interpretation.	Other Courses with Systems Group Input or Concepts *Manufacturing Technology* (T355). Introduction to materials processing and broader issues associated with process selection and how they operate in a manufacturing environment. *Manufacturing: Management and Technology Program* Structure and Design of Manufacturing Systems (PT611), Manufacturing Management (PT613), Implementation of New Technologies (PT621), Enterprise and the Environment (T830), Quality Management (T831), Quality Methods (T832), Project Management (PMT605), Human-Computer Interaction (PMT607), The Master of Science Degree Project (PT801). *Third World Studies* (U204): 1983–1991 (U208). *Third World Development* (U208): 1991– Interdisciplinary problem-solving approach to development issues beyond traditional political economy approach. Strands: physical and social environment; cultural expression in literature and music related to social, political and economic life; gender relations and access to resources; technology and social change, building up capabilities in technology. Textbooks: Part 1: Poverty and Development in the 1990s: an Introduction. Part 2: Industrialisation and Development. Part 3: Rural Livelihoods: Crises and Responses. Part 4: Development Policy and Public Action. **Course readers:** *Third World Lives of Struggle* by H. Johnson and H. Bernstein (eds), Heinemann Education Books (revised ed.). *Nervous Conditions* by T. Dangarembga, The Women's Press (1988). *The Third World Atlas* by A. Thomas et al, Open University Press, (2nd edition, 1994). *The Hour of the Star* by C. Lispector, Carcanet (1992). *Creative Management* (B882): Business School MBA course.

ment, informed above all by Sir Geoffrey Vickers (Blunden, 1985; Blunden and Dando, 1994), Checkland's Soft Systems Methodology and Ackoff's notions of mess management (Carter, Martin, Mayblin and Munday, 1984). Substantial work on sociotechnical systems failures has integrated both hard and soft approaches (Fortune and Peters, 1995). The impact of these course may be gauged by the fact that the course T301, "Complexity Management and Change. A Systems Approach" was studied by 10795 students between 1983 and 1999.

John Naughton, now a senior systems lecturer at the OU, has made important contributions to the development of SSM (Checkland, 1990), prompted directly by the need to teach SSM methodology coherently. His central concern was how to define whether someone is actually using SSM rather than just claiming to be. He published a guide to SSM where he defined Constitutive Rules, which must be obeyed to be practicing SSM, and optional Strategic Rules (Naughton, 1977).

When the academics responsible for writing T301 (Table I) started in 1982 they began adapting the systems analysis approach of the engineers De Neufville and Stafford (1971), which had been developed in a civil engineering group at the Massachusetts Institute of Technology (MIT). The T301 course team were not fully satisfied with the original method developed by De Neufville and Stafford so developed a new starting sequence for the application of the hard systems method (HSM) because from experience they knew that it was the initial starting conditions that often shaped how the analysis proceeded. The course team saw the starting point as a decision, problem or opportunity. With this change in emphasis at the start the course team recognized that it was no longer essential to have a client—consultant relationship, but that the approach was available to every-day decision making.

Systems staff have had an innovative influence in shaping the way technology is taught at the OU. Staff from Systems were responsible for the early emphasis in the technology foundation course (Living with Technology—Table I) on political, institutional and social issues. This has spread beyond the courses to influence the way technologists and engineers involved in writing them think about their own subjects. By the second edition of *Fuel's Paradise: Energy Options for Britain* (a set book for Living with Technology), the author saw the nontechnological components as being the most significant factors in energy choice and policy (Chapman, 1979). Chapman later became Professor of Energy Systems in the Systems Department.

The department has also been influential in shaping the direction of systems as a discipline in the UK. Concern with General Systems Theory (GST), the domain of "systems concepts as such" (Checkland, 1981), has been minimal in the UK. Naughton (1981) has characterized systems studies as "craft knowledge" to highlight its emergent nature (1981). This view starkly contradicts the GST project which hoped, some would say still hopes, to develop "theoretical systems which are applicable to more than one of the traditional departments of knowledge" (Checkland, 1981, citing an announcement in the journal Philosophy of Science, 1955). The implicit expectation was that scientists of all types would adopt a general theory and apply it in their own subject domains.

For Naughton and Checkland, GST failed because it provided only "a melange of insights, theorems, tautologies and hunches ..." [Naughton (1979) quoted in Checkland, 1981)].

> Most systems science exercises are virtually indistinguishable from those that might be done by the traditional discipline and procedure-bound scientists we so freely criticise ... we tend largely to attack the same problems as do the normal scientists, and we most often attack them in exactly the same way. (Naughton, 1981 quoting Sutherland, 1978)

Not only is the idea of developing an "overarching meta-theory" (i.e., a theory which contains or explains disciplinary theories) unrealistic but also GSTs are further handicapped by an inherent lack of subject matter. They are "mechanism-free" and "stuff-free" (*ibid*).

> They can describe the behavior of certain systems but not explain how they work ... they make no detailed assumptions concerning the nature of the components of the systems concerned. [Naughton (1981) quoting Bunge (1977)]

Naughton concludes that GST's problems lay in its lack of a professional focus:

> What this implies is that systems theory needs a tradition of real-world systems practice in order to progress. (Naughton, 1981)

This is the direction that systems-as-discipline has since taken, both at the OU and in the UK generally. The main thrust has since been on methodological and practical issues in problem-solving and management at a relatively micro level.

3.3. Systems Practice Without General Systems Theory

Naughton's criticisms were undoubtedly valid and, with regard to developing universally applicable meta-theory, they still are. Nevertheless, Systems would not have become defined as a discipline without GST foundations. The thorough undermining of the foundations must have shaken the discipline and, perhaps, the confidence of academics in further developing systems theories, at least in the UK. Has this contributed to the crisis about what exactly constitutes systems as a discipline?

As Checkland has written:

> because systems ideas provide a way of *thinking* about any kind of problem, *systems thinking is not itself a discipline*, except to the extent that there will be a few people whose professional concern is with systems concepts as such. (Checkland, 1981, our italics)

For Checkland, the "few people" were the (denigrated) General Systems Theorists. Nowadays, we would, perhaps, refer to systems theorists in general.

Undermining GST may have had the long-term, unintended impact of throwing the baby out with the bath water. For whatever reason, little theory has been developed in the UK Systems community. Exceptions may prove to be the elaboration of Critical Systems Theory at the Hull University Centre for Systems Studies, and at the University of Lincolnshire and Humberside, grounded in management practice (Flood and Jackson, 1991), further elaborations of VSM (Espejo and Harnden, 1989) and John Mingers' work on autopoeisis at Warwick University (Mingers, 1995).

We shall return to this issue with regard to the future direction of Systems. First we shall look at whether the OU SWOT analysis offers any lifelines to the baby.

4. CRITICAL REFLECTIONS ON OU COURSES AND ON SYSTEMS-AS-DISCIPLINE

4.1. SWOT Analyses of the Open University Systems Courses

Following the appointment of a new Professor of Systems in 1994, an invitation was extended to OU tutors to give their opinions of the strengths, weaknesses, opportunities, and threats of systems courses. This was part of an ongoing process of review designed to be open and participatory (Maiteny and Ison, 1997).

Thirty one responses were received dealing with issues from course content, delivery, and marketing to department–tutor relations and the nature of systems. Some commented on the department and university as well as particular courses.

Further information was gathered through semi-structured interviews and day-to-day departmental activity. In September 1995, the department gathered for 3 days at Clare College, Cambridge, to reflect on future directions and for staff to exchange views. Many respondents have also been OU Systems students. The results have been syntheiszed here.

4.1.1. Coherent But Out-of-Date

There was almost unanimous praise for the OU's "coherent suite of systems-based courses." This is still a rarity in universities and was seen as a major strength of the department. Some material was considered to be out-of-date and too biased toward Britain, in both content and presentation. Some of it was too management oriented. There was a tension between those favoring an emphasis on "hard" systems and others who felt that systemic perspectives on social, political, development, and environmental issues were more important in today's world.

4.1.2. Contextualizing for Some, Blinkering for Others

The courses were commended for stimulating "hard," engineering-based students to contextualize their work in the human and environmental dimensions. This was the original rationale for establishing Systems in the Technology Faculty and is seen as just as important today despite, or perhaps because of, the proliferation of systems thinking in nonacademic contexts compared with 20 years ago.

For students already acquainted with systems thinking, the courses seemed limited and to lag behind systems developments elsewhere in society—in environment, development or "holism," for example. This is partly due to the slow course production and review process, partly to the backgrounds and biases of academics. The courses have provided a more structured approach to systems than is evident in "popular" systems thinking but some respondents considered the content could be better attuned to the developments in systems thinking and applications outside systems departments and outside academia.

4.1.3. Connecting with Systems Outside "Systems"

Courses must be designed to stay in step with market demand if they are to remain popular, inspiring, and challenging to a wide spectrum of students. It is therefore imperative that academics keep abreast of new developments in, and applications of, systems thinking, both inside and outside Systems departments and the academy generally. Many respondents favored incorporating systems ideas and applications that are new to the OU, and often new to the British systems movement. Relevant fields include information technology, ecology and environmental management, sustainable development, social and political systems, religious belief, and systems approaches to science generally.

Schools of systems thinking outside the UK already deal with many of these fields. Systemists on the continent have tended to focus more on social issues at a macro scale than their island cousins who have stressed management applications and methodologies instead. As one person quipped, "all the GST people have continental accents and unpronounceable names!"

Some respondents argued that "fringe" areas such as complementary medicine, personal development and spirituality should also be considered. They are often associated with systems thinking.

The imperative to keep up-to-date with the cutting-edge of systems thinking in the traditional subject-disciplines should not be a problem in a multidisciplinary department committed to systems perspectives. For some respondents, it was considered unwise to continue putting all the systems eggs in the technology and management basket. Systems thinking in these areas is facing increasing competition from management schools. "We should seek to turn our attention to subject areas that have not yet been hit by the 'systems bug'," suggested one respondent.

4.1.4. Systems as Living and Learning

An interesting perspective was that systems thinking is, above all, a social and life skill. This could be reflected more closely through courses in systems and lifelong learning. This is inherently interdisciplinary and multidimensional. It addresses all aspects of an individual's life, from career development to interpersonal relations and personal meaning (World Initiative on Lifelong Learning, 1995a,b). An added, and by no means trivial, ingredient that places this area squarely in the domain of systems is the relevance of second order cybernetics, and related insights on double- and triple-loop learning (see Open University, 2000), in assisting people to reflect on their lives and fundamental needs as well as to learn how to learn effectively.

A recurring and related theme was the need for reflection on defining the nature of Systems itself, in dialog with the wider systems community. Difficulties arising from the identity crisis should be seen as opportunities rather than the threats they tend to be seen as at present. Many pointed out that systems is "flavor of the month" in many quarters and there is, thus, no need for a defensive attitude.

4.1.5. Systems: "Things" or a Way of Knowing?

Interdisciplinarity was a theme that kept emerging from the SWOTs as a possible focus for the department. This seems most appropriate. Systems is concerned with the *relationships* between things "that can be actualized in a number of different ways" [Checkland (1984) quoting Battista (1977)]. It is a means of conceptualizing, understanding, and linking "things" that have already been "actualized," defined, or bounded, and that normally constitute the domains of subject-disciplines. These "things" can, of course, be viewed as systems in themselves but the distinction between using the word "systems" as an adjective or as a noun is an important one.

To speak of "systems biology" or "systems social science" means that a systems approach is being brought to bear on these domains of inquiry. Here, "systems" is an adjective. Used as a noun to describe the "things" studied, "systems" becomes a noun. "Biological," "technological," or "social" systems are neither disciplines nor approaches to disciplines. They are simply cognitively bounded "entities" that come to be called "systems" once they have been conceptually defined, or actualized. Hence, some systems academics emphasize systems-as-things that physically exist—machines or leaves, for example. Others emphasize systems-as-approach. The two modes clearly overlap in the hands of an epistemologically aware systems practitioner (Open University, 2000). The former stresses the analysis of systems once they have been conceptualized, the latter, the process of conceptualizing. Once conceptualized, systems and their environments are described according to the domain of inquiry that deals with them. They are "biological," for example, and/or "social."

In sum, as a noun, "systems" is a shorthand for a system-environment or system-subsystem relationship. As an adjective, it describes the rigor of thinking systemically in exploring the nature and quality of these relationships in particular contexts. We could say that *Systems Thinking thinks Systems into existence.*

Systems thinking can be used in any traditional discipline and, importantly, *to link these disciplines and facilitate interdisciplinarity.* Contexts must always be defined, generally by the domain of one or more other disciplines. Even the General Systems Theorists had to do this. Otherwise systems scholarship runs the risk of remaining ethereal and abstract. This is not of course to dismiss the potency of a good idea or a new metaphor.

Systems learning, then, seeks:

> . . . to uncover and understand relationships, grasp the patterns that connect, and recognise the embeddedness of systems and their interdependencies. In systems learning, synthesis is the primary mode of inquiry. (Banathy, 1988)

But something must always be synthesized and individuals must have the skills to translate thinking into action. Systems learning cannot be done in the abstract.

5. THE EXPERIENCE OF SYSTEMS ACADEMICS

In recent years, many systems academics have tended more toward their original specialisms than to systems approaches to them. Academic organization and research assessment boundaries encourage this. Despite the rhetoric, there are few incentives to cross subject boundaries and run the risk of losing one's disciplinary home. It still does not pay. . ..

> . . . to complement specialists, who know more and more about less and less, with highly trained generalists who know just enough about almost everything to be able to see the whole forest and not only a multiplicity of trees, and who can therefore be better relied upon to guide our steps through the many forks and crossroads along our way. (Laszlo, 1989)

As individual trees in a multi- (but not yet inter-) disciplinary copse, staff in the OU department have in the past experienced a profound sense of isolation from their colleagues in other subject-disciplines.

5.1. The Open University Systems Department as "Polo-mint"

OU Systems staff often described departmental culture, sociality, course profile and raisons d'être as lacking a center—like a ring doughnut or polo-mint. Staff experienced themselves on the edge, not at the heart of the department (Armson and Ison, 1995). This suggested a need to identify what is at the heart of the department—and, perhaps, of systems-as-discipline itself.

In subject-discipline departments academics keep up-to-date with developments in the core discipline (and sub-disciplines). In their own research they select and apply theory and methods they consider appropriate. Some of these options are systems approaches.

Systems academics have to do the opposite. In Systems, theory and methodology, as practice, is at the core of the discipline. The subject-domain is brought to it, and "allows" it to be applied, rather than vice versa. Hence, the multi-disciplinarity of systems departments. The integrity and sustainability of systems-as-discipline depends on the commitment of divergent practitioners to a similar way of thinking and, hopefully, enthusiasm in drawing out commonalties.

Effective communication is essential if multi-disciplinarity—i.e. many disciplines existing side by side but with little cohesion or combined explanatory power—is to transform into interdisciplinarity—i.e. the disciplines working together to contribute to a fuller picture. Or, using Laszlo's image, so that the various species of trees are seen to relate and form a forest, not just a multiplicity of species.

Some SWOT analyses expressed a fear that systems risks being too inward-looking and out of step with its subject-oriented environment. This perhaps reflects the double workload of Systems academics in keeping up with developments both in systems and in their subject-domains. It also reflects a lack of awareness of systems approaches used in subject-disciplines where the key words that attract systemists' attention are not necessarily flagged.

The considerations above pose two questions that recur time and again at the OU and in the systems community: (i) What is the status of Systems as a discipline compared with others, given that it deals with "process" or "context" rather than "subject?" (ii) How might more cohesiveness be achieved in a Systems Department, specifically the Open University's?

6. SYSTEMS AND CRISES OF DISCIPLINE

6.1. Systems Identity: Discipline or Epistemological Influence?

The problem of systems identity and direction was one of the strongest and most pervasive themes in the SWOT analyses and conversations. Where does Systems belong? Technology, philosophy, management or social science? Is it a discipline in its own right? If so, what is its domain of inquiry, its subject-base? Checkland (1981) defines systems as the study of "organized complexity." But "organized complexity" is a feature common to all traditional disciplines. It does not define a domain of inquiry grounded in the same sense as biology or philosophy.

These are worrying questions that bear on the cohesiveness of systems-as-discipline. The OU Department had individuals with backgrounds in mathematics, physics, biology, agronomy, engineering, IT, management, operational research, geography, anthropology, philosophy, and more—it is multi-disciplinary. Gordon Dyer (1993) succinctly describes the difficulties caused by the multidisciplinarity of Systems. Each discipline appears to want to "own" systems, rather than work with others to integrate perspectives. Again, the OU department encapsulated these difficulties.

> Members of the contributory (i.e. subject) disciplines will, even within a systems approach, first want to incorporate their own visions and techniques to problems they encounter before they readily accept others. The mathematician-systemist will look for outlets for computer modelling; the psychologist-systemist will look for ways for human behavior-centered exploration."

Each has also engaged with systems at different times and in differing "appreciative settings" (Vickers, 1968).

> If the systems community is to achieve its full potential and collaborate and cooperate effectively … it is vital for us all to recognize the roots of our own systems approach and to appreciate how our contribution, and that of colleagues, fits into the totality of systems practice. (Dyer, 1993)

One core systems perspective will never be possible. Neither, perhaps, will a common identity. Dyer acknowledges that systems approaches in different subject-disciplines have their own roots and histories. But he appeals for commitment to linking the approaches that have emerged from the subject-disciplines. A spectrum of systems-oriented disciplines is then conceivable that begins to paint a more complete picture of the world than any one, or two, disciplines can possibly do on their own. But, without commitment to systems in one's own discipline *and* a recognition of systems in others' disciplines, it will be impossible to agree on common metaphors and re-visioning the unity in diversity so characteristic of systems-as-discipline.

6.1.1. Defining a Discipline

The word discipline shares common roots with disciple and is derived from "dek" and "kap" meaning to take, accept, grasp or hold (Shipley, 1984). A common understanding of learning—"to take in" arises from these roots which are also linked to military activity associated with training and adherance to rules. "Systems" arises from the Greek root "sta" as in "synhistaniai"—to stand or stay, and here implies "that by which things stand together" or are "placed together" (Capra, 1996).

The notion of systems-as-discipline seems to contradict systems' logic regarding bounded disciplines and reductionism. Within this logic, and the etymology of "discipline," systems cannot be considered a conventional discipline any more than "reductionism." Neither has a definable domain of inquiry which it "holds." Rather, both are epistemological stances on disciplinary domains;

ways of approaching, thinking and knowing about what we refer to here as the subject-disciplines.

6.1.2. The Emergence of an "Epistemological Discipline?"

Reductionism has never been defined as a discipline or, for that matter, as a metadiscipline because, we suggest, it has become the accepted epistemological basis for the practice of science (Maturana, undated), producing and reproducing a hegemonic culture of science. It has shaped the prevailing culture and appreciative setting of academia and society which has, in turn, inhibited the development of systems approaches.

For many, systems thinking is a response to the trap of science as practised (Capra, 1982). This raises the spectre of another trap, the common tendency to see the pairs: reductionist—holism, hard—soft or positivist—constructivist as dualisms rather than dualities. As Reyes (1995) notes, two concepts form a dualism when they belong to the same logical level and are viewed as opposites. The logic behind this is negation. By contrast, two concepts form a duality when they belong to two different logical levels and one emerges from the other. The logic behind this dialectic is self-reference. The liberating potential of systems thinking, particularly second-order cybernetics, is that it enables epistemology to be brought into the conversation. It invites systems practitioners to operate from a position where one is prepared to acknowledge an epistemological preference in a given context (Open University, 2000).

Within the dualistic framework systems can be seen as advocating an alternative, or parallel, approach to science. But it became defined as a discipline precisely because its development within the subject-disciplines was inhibited. Systems-oriented scholars and practitioners came to identify themselves with the quasi-disciplinary banner of "systems" in their efforts to gain institutional and cultural credibility by building up the "cultural capital" (Bourdieu, 1988) of systems thinking. "Cultural capital" is simply a convenient term to describe the political strength of orthodox discourse in resisting the challenge of less dominant points of view. It is similar to Foucault's notion of knowledge arising in relations of power (1980). In a fascinating study of Paris academe, Homo academicus, Bourdieu shows how academics who we now consider seminary influences appeared

> . . . like religious heretics, or, in other words, rather like freelance intellectuals installed within the university system itself, or at least, to venture a Derridean pun, encamped on the margins or in the marginalia of an academic empire threatened on all sides by barbarian invasions (that is, of course, as seen by the dominant fraction). (Bourdieu, 1988)

Foucault, Lacan, Althusser and Derrida were among the most notable of those on the margins, and all were opposed by those with more political influence in the universities in order to preserve the orthodox ground.

Similarly, the early systems movement had the weight of "cultural capital" against it and it was difficult for scholars to develop systems perspectives within their specialist disciplines. Orthodox academic discourse inhibited, or concealed, the common ground between disciplines and sub-disciplines whilst revealing (i.e. emphasising) their differences. Synthesis and communication of shared principles was, and still is, further undermined by systems related professional organisations promoting differences rather than commonalties (Boulding, 1985). Systems, in sum, was caught within the very construction that it strove to change but within which it still had to operate and remain viable until the prevailing culture and structures themselves changed.

This is beginning to happen despite institutional and commercial pressures to the contrary. On the whole, specialisation and reductionism are still valued above synthesis and systemics and specialist, "secret knowledge" continues to inhibit public understanding of science and interdisciplinarity (Burgess *et al.*, 1991). In academia, organizational boundaries make it risky to do anything else. Pressures on research and teaching to generate wealth and commercially viable products rather than long-term ecological, economic, social and personal sustainability favour specialization.

Yet systems thinking and interdisciplinarity are seen as increasingly relevant at a time when we are recognizing the immense complexity of the world and the inadequancy of reductionist epistemology to cope with it. This again suggests that Systems is more an epistemology—a way of knowing and seeing—than a discipline.

Groupings of systems thinkers are still needed to continue building cultural capital (Checkland, 1995). But the question is, are they still the "systems community" as habitually understood? Or have they expanded to other disciplines and social movements that have developed systems ideas in their own right, just as Checkland (1981) foresaw? How should the systems community relate to this growth in cultural capital?

7. THE EMERGENCE OF A SYSTEMS LEARNING SOCIETY

7.1. Systems Learning Academia

> It would be naive to imagine that (a basic language of systems ideas) or any such general systems model will be consciously adopted by systems thinkers in widely different disciplines. Rather, over a period of time, there is likely gradually to emerge a consensus on the ideas which have been found useful and on the language in which they are expressed. (Checkland, 1981)

The emergence of such a language is gaining momentum and cross-disciplinary dialog is beginning to take place. This, of course, is a very Latourian notion (Latour, 1987) and suggests that, to date, the work has not been done to "black box" systems despite recent attempts by some to seek patents for the term "systems thinking." What a Latourian analysis raises, however, is the question of whether it is appropriate that systems-as-discipline should become the unchallenged, unquestioned "black box" or "fact of life" that some of the existing disciplines have become (Ison, 2000a). Should we not celebrate being asked the question: What is a Systems Department? or What is a Professor of Systems? Through these questions we are able to experience systems as alive and as process rather than something that "is." From this perspective those who claim the demise of GST or some replacement(s) may be premature or asking the wrong sorts of questions.

Some of the key academics employing systems concepts but which in 1995 remained largely outside the discourse of the UK systems community are Paul Davies (1992) in physics and cosmology, John Cobb (1972) in theology, Robert Costanza (1991), and Herman Daly and John Cobb (1989) in economics, James Lovelock (1991), Brian Goodwin (1992) and Mae-Wan Ho (1991) in biology, Tim Ingold (1991) in anthropology, Humberto Maturana (1987) and Francisco Varela (1992) in cognition, Kaufmann (1992), Laszlo (1991), and Ceruti (1994) in evolutionary studies, Slaughter (1995) in futures studies, Senge (1990) in management studies, and John Shotter (1991) in social psychology. The Scientific and Medical Network, a British forum including many eminent scientists and professionals with 1,600 Members in over 50 countries is concerned with many systemic issues and is growing at over 15% a year (Mortimer, 1995).

Consider the systems flavour of the following passage by Ingold:

> ... my criticisms are levelled at the very logic that sets up these biological and anthropological views as alternatives in the first place. This is the logic of a discourse, commonly known as "western," whose ontological foundation is a separation between subjective and objective domains, the first an inner world of mind and meaning, the second an outer world of matter and substance. It is of course this separation that underwrites the conventional academic division of labour between the "humanities" and "natural science" and, within the discipline of anthropology, between its "sociocultural" and "biological" wings. When social or cultural anthropologists accuse their biological counterparts of such sins as "reductionism", or when, conversely, biological anthropologists accuse their "sociocultural" counterparts of adhering to a mistaken assumption of qualitative uniqueness, the fundamental premises on which their respective positions are established, and which are shared by both sides, are merely reproduced. My own view is that the only way to escape from these sterile cycles of accusation and counter-accusation is to dissolve the received subject-object dualism of Western thought ... (Ingold, 1991)

Ingold argues neither for the primacy of biological determinism and objectivity, nor for that of cultural construction and subjectivity. He is arguing for mutuality between the two—a duality. The purely constructivist view, he holds, reproduces the very same dualism as the realist view.

> For example, the capacity for speech is said to be innate, an intrinsic (i.e., biological) property of the human organism, whereas the particular language a person speaks comes to him or her from the community, having its source in society (i.e., it is constructed). The child's acquisition of a mother-tongue, however, is inseparable from the development of its powers of speech, and takes place within the same relational matrix. Thus it is absurd to claim that the relationships that form the context for the child's learning to speak ... are either biological or social. They are obviously both. (Ingold, 1991).

While Ingold's concerns are also shared by some in the recognised systems community (e.g., Mingers and Gill, 1997) it is clear that a great deal of systems learning has been taking place in disciplines that once seemed hostile to systems perspectives. There are now systemists, in all but name, in a wide range of subject-disciplines. Yet the formal links between Ingold and other systems-oriented scientists and systems-as-discipline is often ambiguous. Furthermore, the extent to which the latter has contributed to the development and dissemination of leading-edge systems theories is questionable.

There are at least two perspectives on this:

1. The systems movement is being challenged by its own successes.
2. The discourses which have historically surrounded the systems movement—whether one starts with early philosophers (Fuenmayor, 1995) or von Bertalanffy and others—are no longer as subjugated as they once were because of a rising collective mismatch between experience of the world and the explanations and institutions realised by the prevailing and dominant discourses (e.g., positivism, reductionism). An elaboration of this latter perspective is the emergence of new and, for the current generation, powerful metaphors and theoretical perspectives such as chaos, uncertainty, process thought, nonlinear systems, ecology, fuzzy logic and complexity.

Dyer's "communication problem," it seems, is far larger than expected. It is surely time to extend the "systems community" beyond systems-as-discipline, and even academia, to incorporate systems orientations in subject-disciplines and the "persistent counter-culture" to which Ingold refers. A key book in the systems counter-culture is Capra's The Turning Point: Science, Society and the Rising Culture (1982). It is sobering to think that such a widely read and influential book has only recently been discovered by Ackoff (1995) who is now strongly urging systemists to become familiar with it. That they are not familiar with it already highlights the seriousness of systems-as-discipline's predicament and the degree to which it has lost touch with the dissemination of its own thinking.

Systemists are in a paradoxical position, struggling with their own identities while systems thinking is on the acscendant. They see the convictions that led many out of their parent disciplines into Systems departments now being taken up in their original "homes." Those who choose to continue identifying themselves as systemists need to respond appropriately to their changing appreciative setting if they are to avoid being overshadowed by their subject-discipline colleagues. This will entail clarifying the features that now distinguishes systems from other disciplines.

We suggest three strategies. The first is the potential of Systems departments in demonstrating coherent and rigorous interdisciplinarity. There is a great need for this in addressing the innumerable, complex and interrelated problems facing society, for example global environmental change (O'Riordan, 1994). The second is for those who claim to be systemists to work harder to bridge the divide between their espoused theory and their theory in use (Argyris and Schön, 1996) particularly in their own institutional contexts. The third is to develop a rigorous pedagogy for "systems practice."

7.2. Rescuing Systems as Conversational Space for Shaping Inter-disciplinarity

The early systems movement coalesced when systems theorists from various disciplines collaborated to enhance their cultural capital. In some ways, what is proposed here is not so different except that a great deal of credibility has accrued to systems perspectives since the 1950s. Nowadays, systems perspectives are actually welcomed in some quarters of science and society. In this light, "systems," as a disciplinary label under which to accumulate cultural capital, may be less relevant. It is, however, well-placed to take the lead in facilitating dialogue between systems-oriented subject-disciplines—to become a conversational space specifically for formulating interdisciplinarity.

7.2.1. Interdisciplinarity in Research and Education

Systems departments are quite unique in that their diversity is equivalent to a whole faculty or even university at the micro level. They could become prototype interdisciplinary universities in themselves. This would echo Boulding's vision that:

> in the original conception of general systems there was a strong element of belief in its educational usefulness, in that it would act as an economizer of human learning. (Boulding, 1985)

In systems-as-interdiscipline there would be a crucial difference. Having learned from Naughton and other critics, it would not set itself the task of coming up with a generalised theory of systems in the hope that it would later be adopted by subject-disciplines. Instead, it would emphasise the relationships, the "grey areas," between empirical domains of inquiry, thus grounding it in professional practice (Naughton, 1981). This was how Checkland (1981) envisaged systems thinking would develop.

A prerequisite to success in interdisciplinary research is, of course, commitment on the part of staff to linking, on equal bases, biological, economic, social, technical and other spheres of inquiry. If too much primacy is given to any one of these reversion to subject-disciplinarity and, often, a dualistic framework tends to follow.

The 1995 OU Systems Department was already strongly multi-disciplinary (i.e., there were many disciplines represented but little dialogue and cohesion between them). This contributed to clashes and identity problems, which tended to be perceived as a threat, but it is also a potential opportunity—if it can be transformed into inter-disciplinarity (i.e., that emphasises overlaps and synergies between the various disciplines). As mentioned earlier, commitment to dialogue and bridge building between disciplines, which a systems approach facilitates, is a fundamental prerequisite but is often unachievable because of organizational and structural constraints (Ison, 2000b) which must first be addressed (this issue will be taken up in future research publications based on experience at the OU since 1995).

Though networks of communication between systems-thinking academics in subject-disciplines are improving, this tends to be limited to research. Courses remain essentially subject-discipline based. The principles of systems thinking, per se, are rarely taught except in the context of the subject-matter. Once again, Systems departments have a distinct advantage. Not only is it part of their raison d'être to teach systems thinking, methods and, perhaps, interdisciplinarity, they can also draw on the subject-embedded systems research of staff members to offer courses that are at the leading edge of systems education.

We suggest, then, a three-pronged strategy for Systems departments:

1. They facilitate dialogue between the subject-disciplines represented by their staff, both within and outside the department, so as to nurture inter-disciplinary theory-building and practice. In this way, they will attract attention as exemplars of interdisciplinarity in practice.
2. Systems, by its very nature calls for a coherence between what is espoused and what is experienced by students, clients, fellow academics—in fact by all who participate in the conversational space that systems thinking and practice can provide. Too often in our experience this has not been the case. This requires strategies which, put bluntly, enable academics to practice what they teach.
3. Applied interdisciplinary systems research would nourish the third strength of Systems departments: education which moves from systems principles and concepts to systems practice which is critically reflective. It would maintain the practical relevance of systems education and

> courses by providing up-to-the-minute case studies and theoretical developments from elsewhere, bringing them together in courses and active learning in a way which few other departments could offer.

Such a strategy holds out the promise of realising Boulding's (1985) hope that systems would rectify its lack of impact in the field of education. This, Boulding believed, was the largest empty niche for future development. The relatively independent development of systems perspectives rooted in subject-disciplines strongly suggests that linking disciplines by focusing on their common ground and boundaries is a more fertile way forward than concentrating on systems concepts in the abstract, as the general systems theorists attempted.

This does not, of course, imply abandoning systems ideas. On the contrary, progress in interdisciplinarity requires continual exploration and development of systems concepts but by emphasising the processes of interdisciplinary dialogue rather than the elaboration of a general theory deemed applicable to all disciplines. This is a subtle but important difference. Neither does it negate the value of the two modes of systems analysis described earlier: systems as an approach to other disciplines perceived as more or less bounded (i.e., "systems as an adjective") and the use of the systems concept as a noun to delineate particular types of system (e.g., biological, technological, philosophical, etc).

We would, however, guard against identifying systems with any one subject domain. Systems approaches are already being used to address an enormous variety of issues across a wide range of domains. This is likely to increase. In the general field of education and development, for example, Senge (1990) has applied it to organisational learning, Bawden (1994) to agricultural education, Heron (1992) to experiential learning and Banathy (1991) and Gregory (1993) to educational design.

For some time to come, those seeking understanding of a particular topic will continue to look first to the subject discipline most closely associated with it rather than to a systems methodology or epistemology. It would therefore be inadvisable, and contrary to the spirit of Systems, to lay claim to particular domains. This would merely perpetuate the confusion as to what constitutes systems as a discipline.

The notions of systems-as-interdiscipline and systems-as-practice offer an opportunity to regain a sense of purpose and vigour premised on aspirations that have always been central to the systems movement. Checkland (1981) notes four aims of General Systems Theory:

1. To investigate the isomorphy of concepts, laws, and models in various fields, and to help in useful transfers from one field to another;
2. To encourage the development of adequate theoretical models in areas which lack them;

3. To eliminate the duplication of theoretical efforts in different fields;
4. To promote the unity of science through improving the communication between specialists.

All four are now occurring, to varying degrees, with the adoption of systems approaches in traditional disciplines. 1 and 4 would seem to be the most fruitful areas for development by systems as an interdiscipline.

8. GENERATING AND SUSTAINING A CREATIVE COHESIVE CORE IN THE POLO-MINT

Assuming the commitment of staff, interdisciplinarity, as an explicit raison d'être of the OU Systems Group, could have great potential for renewing its sense of direction, purpose and cohesion. If staff members collaborate at the interfaces of their various domains of application—sharing, and developing understanding of, the systems terminologies that have emerged from each of those domains—it is conceivable that this would generate an area of common purpose.

Inevitably, interaction would be most frequent and direct between staff with the most closely related domains of application. But the range covered would still be substantial given the range of disciplines. Information Technology, for example, clearly overlaps with electronics on the one hand and cognitive psychology and artificial intelligence on the other. These, in turn, overlap with biology and anthropology; both of these with ecology, and so on with numerous permutations.

It would be helpful if subject-disciplines were reasonably complementary. Far more attention needs to be paid to this than in a traditional discipline. It is precisely the disciplinary interrelations that sustain the common ground which is itself fluid and continually reconstituted. Decisions will have to be made about the range of disciplines to be included and the type of education to be offered, i.e., to what extent will it focus on vocational, technological, management, academic or self-development education? Complementarity between some subjects (anthropology and ecology, for example) and/or the levels at which they are pitched (that is, the practical-theoretical continuum) will clearly be easier to achieve than for others.

Communicative ability and a desire to cross-fertilize and, perhaps, synthesize theoretical perspectives would obviously be critical to such a community of learning. Exploring what it means to be epistemologically aware would be another challenge as would dealing with the transaction costs involved in any attempts to practice interdisciplinarity.

9. CONCLUSION

Systems as a discipline is in a dilemma. Yet systems as a way of thinking about complex problems is on the ascendant. Most people have an idea about what is meant by "holistic" thinking but many seem unaware of the academic traditions that inform Systems. Subjects from biology to theology are now theoretically informed by systems thinking but few of the innovations are originating in systems departments. We have suggested three primary reasons for this.

First, systems academics have lost touch with the fact that theirs is not a discipline in the usual sense of the term. It does not have an inherent domain of inquiry but has to always apply itself to elucidating other disciplines. The process of application of systems theory to diverse contexts and the learning that arises from this is however a legitimate and much needed domain of inquiry. Second, the undermining of general systems theory many years ago, at least in the UK, has arguably left systems in a theoretical vacuum which other disciplines are filling. Third, the growing use of systems ideas has, in large part, passed the discipline by. There is much that is systems but not recognized as such. For these, or other, reasons there has been a significant reversion among Systems researchers to their parent subject disciplines without necessarily applying a systems approach. Systems-as-discipline appears to have lost touch with some of its major strengths; strengths that set it apart from other disciplines and could be turned to important advantage at this time. Perhaps, the most important feature is its inherent interdisciplinarity.

The vision of systems as interdiscipline is a step back from the view of systems as metadiscipline. It does not negate the ultimate goal of eventually realizing some form of general account of the world in systems terms, but seeks to respond to the prevalent view that this is more likely to emerge from within subject-disciplines and their interaction. Systems-as-interdiscipline would be dedicated to interdisciplinary understanding, communication, and interpretation in the first place. This may prepare the ground for the emergence of a more encompassing understanding, perhaps setting an example for interdisciplinary activity elsewhere (Tait *et al.*, 1997).

Systems understanding is at the cutting edge of societal learning in an age which is acknowledged to be more interactive, in almost every way, than any other. This is not theory, it is experience. Interdisciplinary focus, therefore, matches the current environment, including the educational "market," in which the supply of rigorous interdisciplinarity is lagging well behind the demand, largely because of the difficulty in breaking the seals of disciplinary boundaries.

This is a major opportunity for Systems departments. They have a comparative advantage over traditional disciplines in making the most of it, both as providers of systems education (which other departments will provide this?) and as interdisciplinary researchers. Interdisciplinarity and synthesis ensure their distinctiveness from other disciplines that are just beginning to take systems thinking on board. Let us hope they themselves have not become too departmentalized to make the most of it. Commitment to systems and interdisciplinary team-working and to the development of individual's own reflective systems practice are a prerequistie.

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